

Does Volatility in Crude Oil Price Precipitate Macroeconomic Performance in Nigeria?

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ABSTRACT: This study examines the effects of crude oil price changes on economic activity in an oil dependent economy-Nigeria. A small open economy structural vector autoregressive (SVAR) technique is employed to study the macroeconomic dynamics of domestic price level, economic output, money supply and oil price in Nigeria. The sample covers the data from 1985:q1 to 2010:q4. The Impulse Response Functions (IRFs) and the Forecast Error Variance Decompositions (FEVDs) results suggest that domestic policies, instead of oil-boom should be blamed for inflation. Also, oil price variations are driven mostly by oil shocks, however, domestic shocks are responsible for a reasonable portion of oil price variations.

Keywords: Oil price; Monetary policy; Fiscal policy; Inflation; Nigeria

JEL Classifications: E31; E52; E62

1. Introduction

Energy plays the central role in the world economy. In spite of considerable inclination to alternative renewable sources of energy like wind, water, nuclear and solar power, the role of crude oil in macroeconomic movements has not waned yet. So, oil shocks may have macroeconomic consequences in both oil exporting and oil importing countries. Because in the former group, oil is the major source of revenue and in the latter, it is a major input for production system. Despite – and maybe due to- this mutual strategic importance, oil price is highly volatile; even more than any other commodity (Dehn, 2001). Likewise, its fluctuations are hardly predictable. These facts led to a great number of researchers studying the effects of oil price changes on economic activity, identifying the mechanisms through which these effects transmit and proposing effective monetary and fiscal policies to prevent negative impacts of such shocks (e.g. Hamilton, 1983, 1996; Bernanke et al., 1997; Bernanke, 2004; Devlin & Lewin, 2004). These studies found that oil price change is an important source of macroeconomic fluctuations such that its increase worsens the economic situation of most countries. Of course, all the mentioned studies – like most of other papers in this body of literature - focused on industrialized oil importing economies and their results are valid only for such countries.

The story in oil exporting countries is totally different. In most of oil exporting countries, like Nigeria, government which is considerably large in comparison with small private sector, directly receives the oil revenue. Spending this revenue, government's behaviour becomes the most important characteristic of the economy. In other words, the funds needed for government's expenditure come from oil revenue. So, fiscal and monetary policies depend upon oil price (Rosser and Sheehan, 1995). In these economies, oil price fluctuations, if preventive actions do not take, transmit to real exchange rate. Since any rise or fall in the oil price is not permanent, oil revenue variation injects instability to the economy. In this situation, so called —resource curse occurs. When oil price rises, the government has more money to spend. In other words, according to Kilian (2005), when the country's terms of trade are favourable, oil-dependent government's spending can be easily financed through oil revenue. Though, this revenue can be used to finance developmental projects to increase the welfare, but inefficient public spending and fiscal expansion lead to wastes. This destructive strategy, over time, makes economy more vulnerable to oil price volatility particularly in the presence of capital market imperfections (Anashasy et al., 2005).

The other side of this coin is even worse. When oil price depreciates, large public sector expectedly, cannot reduce its spending immediately and proportionately; then faces huge deficits. The fiscal imbalances followed by an oil price decrease can be devastating if the country is highly dependent on oil revenues; which is the case in most of oil exporting countries like Nigeria. More disappointingly such falls are usually unpredictable. Several incomplete projects and huge debts are the main inheritances of this period for the following fruitful era. After some harsh experiences, nowadays, isolating the real sectors of economy from oil price volatility is accepted as one of the most important roles of government.

Considering this background, oil price variation plays a significant role in macroeconomic fluctuations in oil exporting countries; so, studying this role and identifying the impacts of oil shocks on other macroeconomic indicators is of great importance. Despite the fact that oil-exporting countries have experienced large and major fluctuations as a result of oil shocks, great body of researches have analyzed the impacts of oil price variations in the developed country and specially US economy (Jimenez-Rodriguez and Sanchez, 2005); such that only a limited number of studies have focused on oil exporting countries (Berument et al., 2010).

In this paper, a small open economy Structural Vector Autoregressive (SVAR) method will be explored to examine the sources of macroeconomic fluctuations in Nigeria. The Structural VAR (SVAR) approach builds on an earlier work of Sims (1980) by attempting to identify the impulse responses through *a priori* restrictions on the covariance matrix of the structural errors. The essence of this is to simply avoid arbitrary identifying restrictions which characterize the unrestricted VAR. The main advantage of structural VAR analysis is that the necessary restrictions on the estimated reduced form model, required for identification of the underline structural model, can be provided by economic theory. Once the identification is achieved, it is possible to recover the structural shocks. These shocks can then be used to generate impulse response and variance decomposition functions to assess the dynamic impacts on different economic variables.

Furthermore, the study focuses on the macroeconomic dynamics between, domestic price level (CPI), economic output (GDP), money supply (M_2) and oil price (OP) in Nigeria. To evaluate the relative importance of these variables in the movements of other variables in both short- and long-run, Impulse Response Functions (IRFs) and Forecast Error Variance Decompositions (FEVDs) were explored. Our sample covers the data from 1985:q1 to 2010:q4. The remainder of this paper is organized as follows. Section 2 briefly reviews some of the related works in the body of literature. Section 3 introduces the model and the sources of data. Section 4 presents the empirical results and finally, section 5 concludes.

2. Review of Literature

Studying the role of oil price in macroeconomic dynamics came to the focal point of research since 1970s. Hamilton (1983) claimed that seven out of eight economic recessions in the US after World War II were preceded by oil price hikes, developed a new strand followed by several researchers. Focusing on US economy, researchers argued that oil shocks lead to higher inflation and lower output. Some researchers asserted that the role of oil price in cyclical movements of economy is even more important than fiscal and monetary policies (Gisser and Goodwin, 1986) while some researchers believed that policy responses to oil shock can considerably lessen its impacts. According to them, historical coincidence of oil shocks and economic recessions is not enough to conclude that there is a causal relationship between them. They suggested monetary policy as the third force responsible for this connection (Dotsey and Reid, 1992; Bernanke et al., 1997). Meanwhile, the idea of asymmetric effects – of positive and negative shocks - on macro movements of economy is developed (e.g. Tatom, 1988). Regardless of different approaches, researchers conclude that there is a negative correlation between increases in oil prices and the subsequent economic downturns.

Jimenez-Rodriguez and Sanchez (2005) investigated the effects of oil price shocks on economic output in G7 countries and Norway. Kilian (2005) and Hooker (2002) are two other studies focused on G7 countries. Expectedly, like previous studies, they concluded that oil price hikes result in economic recession. In oil exporting countries, on the other hand, macroeconomic fluctuations and the role of oil price have been subjected to some studies focused on both country specific and cross country analyses. For instance, Al-Mutairi (1993) claimed that dependence of the fiscal policy on oil price significantly affects output movements in Kuwait. In addition, Eltony (2001) approved the causal relationship from

oil revenues towards other macroeconomic variables in Kuwait. He also identified the government's fiscal stimuli as the main determinant of domestic prices. Dibooğlu and Aleisa (2004), investigating the sources of macroeconomic fluctuations in Saudi Arabia using Structural VAR method, showed that —price level, real exchange rate, and to a lesser extent output is vulnerable to terms of trade shocks which are driven by —output, trade balance, and aggregate demand shocks. In the case of Venezuela, Anashasy et al. (2005) investigated the relationship between oil prices, government revenues, government consumption spending, GDP and investment by a VAR/VECM model and concluded that fiscal balance in both short and long run affects economic growth.

Olomola and Adejumo (2006) examined the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria in a VAR framework and argued that oil price shocks significantly determine the real exchange rate and in the long run money supply which may lead to —Dutch Disease. Similar works have been implemented for Indonesia (Ward and Siregar, 2001), Ecuador (Boye, 2001), Mexico (Boye, 2002) and Iran (Farzanegan and Markwardt 2009). Moreover, some researchers analyzed macroeconomic fluctuations in oil-based economies by estimating and comparing the results of individual equations for each country. Among others, Berument et al. (2010), using several individual SVAR models, studied the effects of oil price shocks on the output growth of selected Middle East and North African (MENA) countries that are either exporters or net importers of oil commodities. Their impulse response analysis suggested that the effects of the world oil price on GDP in most of oil exporters, namely Algeria, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Syria and UAE as well as one oil importing country, Tunisia, are positive and significant. However, for Bahrain, Egypt, Lebanon, Morocco and Yemen they did not find a significant impact on oil price shocks.

Alotaibi (2006) investigates the interactions between oil price variations, real exchange rate and price level in the members of Persian Gulf Cooperation Council. Using SVAR model, he concludes that, real shocks do not affect oil price and nominal shocks do not affect both oil price and GDP. His results support Real Business Cycle (RBC) theory by proving that supply shocks have greater impacts than demand shocks rooted in oil revenue. Finally, Alotaibi claims that oil price shocks directly affect price level and have inverse effects on real exchange rate. Also, Mehrara and Oskui (2007) study the sources of macroeconomic fluctuations in four oil-exporting countries —Indonesia, Iran, Kuwait and Saudi Arabia- using a structural VAR approach. On the basis of Variance Decomposition and Impulse Response analyses, oil price shocks are shown to be the main source of output fluctuations in Saudi Arabia and Iran. But in Kuwait and Indonesia, output fluctuations were mainly found due to aggregate supply shocks. Moreover, their results show that oil price shocks in Saudi Arabia steadily expand prices while such impact on the long run prices in Iran, Kuwait and Indonesia is not approved.

Lescaroux and Migno (2008) in three panels of OPEC members, other major oil exporting countries and some oil importing countries investigated the links between oil prices and various macroeconomic and financial variables including GDP, CPI, unemployment rate and bond price. Using causality tests, evaluation of cross-correlations between the cyclical components of the series and cointegration analysis, they found various relationships between oil prices and macroeconomic variables in both the short and long run. In long run, specifically, —the causality generally running from oil prices to the other variables. And, finally, Kireyev (2000), using the mean-group estimator in a PVAR approach, analyzed the effects of both internal and external shocks on macroeconomic movements in 18 Arab countries. In his study, based on the data for last three decades of 20th century, kireyev classified sample countries to various groups and compared the pattern of dynamic adjustments between these groups.

3. The Model and Data

3.1. The Model

Following the wisdom of structural VAR model, the following restrictions are applied to the structural parameters of B in 1. All the zero restrictions are on the contemporaneous structural parameters, and no restrictions are imposed on the lagged structural parameters of the matrix of direct effects of the exogenous variable on the endogenous variables. Specifically, this study uses the non-recursive structural equation shown in equation 1.

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ B_{21} & 1 & B_{23} & B_{24} \\ 0 & B_{32} & 1 & B_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \mu_{CPI} \\ \mu_{GDP} \\ \mu_{M2} \\ \mu_{OP} \end{bmatrix} \begin{bmatrix} \varepsilon_{CPI} \\ \varepsilon_{GDP} \\ \varepsilon_{M2} \\ \varepsilon_{OP} \end{bmatrix} \quad (1)$$

The first equation is the inflation function that characterized the dynamic response of inflation to all variables in the system. The second equation can be interpreted as a short-run output equation with real output allowed to respond contemporaneously to shocks from inflation, money supply and oil price (CPI, M2 and OP). The third equation represents the traditional money supply function in which money supply is a function of real output and oil price (GDP and OP). The last equation represents the exogenous factor of our model, and it suggests that oil price does not respond immediately to all other variables contemporaneously.

In addition, the method of analysis used for this inquiry hinges on the Blanchard and Perotti (2002) long-run restriction approach. In the moving average representation, the sequences CPI, GDP, M₂ and OP can be expressed as a linear combination of current and past structural shocks.

$$CPI_t = \sum_{k=0}^{\infty} S_{11}(k)V_{1t-k} + \sum_{k=0}^{\infty} S_{12}(k)V_{2t-k} + \sum_{k=0}^{\infty} S_{13}(k)V_{3t-k} + \sum_{k=0}^{\infty} S_{14}(k)V_{4t-k} \quad (2)$$

$$GDP_t = \sum_{k=0}^{\infty} S_{21}(k)V_{1t-k} + \sum_{k=0}^{\infty} S_{22}(k)V_{2t-k} + \sum_{k=0}^{\infty} S_{23}(k)V_{3t-k} + \sum_{k=0}^{\infty} S_{24}(k)V_{4t-k} \quad (3)$$

$$M_{2t} = \sum_{k=0}^{\infty} S_{31}(k)V_{1t-k} + \sum_{k=0}^{\infty} S_{32}(k)V_{2t-k} + \sum_{k=0}^{\infty} S_{33}(k)V_{3t-k} + \sum_{k=0}^{\infty} S_{34}(k)V_{4t-k} \quad (4)$$

$$OP_t = \sum_{k=0}^{\infty} S_{41}(k)V_{1t-k} + \sum_{k=0}^{\infty} S_{42}(k)V_{2t-k} + \sum_{k=0}^{\infty} S_{43}(k)V_{3t-k} + \sum_{k=0}^{\infty} S_{44}(k)V_{4t-k} \quad (5)$$

This can be represented in a vector form as follows

$$\begin{bmatrix} CPI_t \\ GDP_t \\ M_{2t} \\ OP_t \end{bmatrix} \begin{bmatrix} S_{11}(L) & S_{12}(L) & S_{13}(L) & S_{14}(L) \\ S_{21}(L) & S_{22}(L) & S_{23}(L) & S_{24}(L) \\ S_{31}(L) & S_{32}(L) & S_{33}(L) & S_{34}(L) \\ S_{41}(L) & S_{42}(L) & S_{43}(L) & S_{44}(L) \end{bmatrix} \begin{bmatrix} V_{1t} \\ V_{2t} \\ V_{3t} \\ V_{4t} \end{bmatrix} \quad (6)$$

Where V_{1t}, V_{2t}, V_{3t} and V_{4t} are uncorrelated white noise disturbances and $S_{ij}(L)$ are polynomials in the lag operator, where the individual coefficients are denoted as $S_{ij}(k)$.

Equation (6) can be written as

$$X_t = S(L)V_t \quad (7)$$

Where

$$X_t = [CPI_t \quad GDP_t \quad M_{2t} \quad OP_t] \text{ and } V_t = [V_{1t} \quad V_{2t} \quad V_{3t} \quad V_{4t}] \quad (8)$$

V_{1t}, V_{2t}, V_{3t} and V_{4t} are the consumer price index, real output, money supply and oil price shocks respectively. The coefficients of $S_{11}(L)$, for instance, represent the impulse response of consumer price index shock on real output, money supply and oil price.

3.2. Sources of Data

The study makes use of quarterly time series data between the period 1985:q1 to 2010:q4. The data were obtained from the various issues of the Central Bank of Nigeria (CBN) Statistical Bulletin, 2011. Oil price was obtained from the British Petroleum Review of World Energy (BPRWE) 2011. The analysis is based on impulse response functions (IRFs) to generalized shocks and forecasted error variance decompositions (FEVDs). IRFs of generalized shocks to the endogenous variables were constructed to track the adjustment path of the response of each endogenous variable to a one-standard-

deviation shock to another variable in the system. Moreover, the decomposition of variance evaluates the relative importance of each of the structural innovations in the fluctuations of the variables at different time horizons.

4. Results

4.1 Descriptive Statistics of the Variables

This sub-section discusses the statistical properties of the variables. That is, the univariate statistics of the variables, which include the mean, median, skewness, Jarque-Bera, kurtosis, among others are reported. The results of the descriptive statistics for selected variables are presented in Table 1.

It is evident from Table 1 that both the mean (first moment) and skewness (third moment) for each of the variables are less than unity (approximately equal to zero for all the variables). For instance, real output had a mean of 0.02 and skewness of 0.63, while the mean values and skewness of consumer price index are 0.04 and 0.82 respectively. The skewness is a measure of the symmetry of the histogram. The rule of thumb for any standardized normal variable is that, both its mean value and skewness should be zero. Based on this criterion, it can be inferred that all the variables in the model have standard normal distribution. In addition, money supply is also positively skewed, while oil price is negatively skewed. A variable with positive skewness is usually above the mean, while a variable with negative skewness is usually below the mean.

Table 1: Descriptive Statistics for Selected Variables

Variable	Mean	Media	Std.	Skewness	Kurtosi	Jarque-	Probability
Real Output	0.02	0.03	0.34	0.63	5.89	16.53	0.00
Consumer Price Index	0.04	0.04	0.02	0.82	2.83	3.84	0.02
Money Supply	0.26	0.27	0.34	1.58	5.24	21.22	0.00
Oil Price	0.24	0.22	0.20	0.04	2.74	0.11	0.05

Source: Author's Calculations, using E-views 7.1.

Furthermore, the results show the kurtosis (fourth moment) which measures the tail shape of a histogram. Variables with values of kurtosis less than three are called platykurtic (fat or short-tailed), with consumer price index and oil price falling under this category. On the other hand, variables whose kurtosis value is greater than three are called leptokurtic (slim or long-tailed) and the variables that qualified for this are real output and money supply. Juxtaposed against these are the probability values and the Jarque-Bera test of normality, which is an asymptotic test. From Table 1, it is clear that the residuals are normally distributed, as the probability values for all the variables are very low, and close to zero while their means nearly equals the corresponding medians.

4.2 Empirical Results: SVAR Analysis

This section presents the main empirical evidence on macroeconomic variables (consumer price index, real output, money supply and oil price) for Nigerian economy by discussing the relative importance of external (oil price) and internal (real output, money supply and domestic price) shocks.

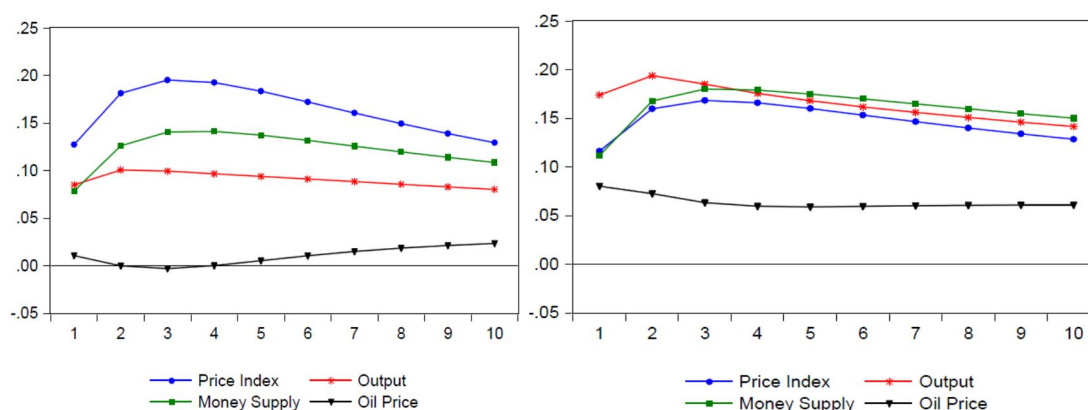
4.2.1 Response of consumer price index

Figure 1 depicts the accumulated responses of consumer price index to generalized one S.D. innovation –described by Lescaroux and Mignon (2008)- of all variables up to ten periods. As Figure 1 portrays, consumer price positively and significantly responds to oil price, monetary and output shocks. Oil price shocks have the dominant effects on consumer price movements. Moreover, innovations in aggregate demand and money supply lead to enduring increase in domestic prices which is consistent with Mehrara and Oskui (2001) for Iran, Indonesia and Saudi Arabia and is contrary to Dibooglu and Aleisa (2004) for Saudi Arabia, especially with regard to the effect of nominal shocks. These increases reach their maximum value in the third period and then, gradually decline in the long run.

The positive impact of demand shocks on consumer price, in addition to usual interpretations, is possibly dependent on the strong interaction between economic output, government expenditure and

oil revenue in Nigeria. In other words, oil revenue jumps usually are followed by expansions in both fiscal and monetary policies which although increase GDP, lead to higher prices. This indirect effect of oil price on domestic prices in oil exporters is one of the special mechanisms of —resource curse which oil exporting countries usually suffer from. Besides, in both short and long time horizons, monetary shocks dominate demand shocks in mitigating price level. According to variance decompositions, monetary shocks in the first period explain 38 % of price fluctuations and after 10 years this share rises to more than 52 %; the fact makes monetary shocks the main cause of price changes. Moreover, both impulse responses and FEVDs, suggest that variations in aggregate demand affect price level less than monetary factors. So, one can conclude that in Nigeria, inflation has monetary roots. Considering the interaction between money supply and oil shocks, this finding emphasizes the importance of appropriate monetary- policy responses to oil shocks.

Figure 1. Response of consumer price index Figure 2. Response of economic output



Finally, oil shocks have a very small and negligible impact on consumer price level. This finding, contrary to Hooker (2002) and Jimenez-Rodriguez and Sanchez (2005) for some developed oil importing countries and Dibooglu and Aleisa (2004) for Saudi Arabia, confirms that oil price hikes are not necessarily inflationary. Eltony (2001), Olomola and Adejumo (2006) and Iwayemi and Fowowe (2011) have reported similar results for Kuwait and Nigeria, respectively. In sum, we can conclude that in oil exporting countries, domestic – not external – shocks are responsible for price instability. This result suggests –if any– indirect relation between oil revenue and inflation.

4.2.2 Response of real output

Figure 2 depicts the adjustment dynamics of real output in response to all four structural shocks. First of all, demand shocks, expectedly, increase aggregate demand. According to FEVDs, demand shocks explain 48% of output fluctuations in first year while this share decreases to nearly one fifth in long run. This result supports the New Keynesian approach to macroeconomic fluctuations who claims that, if we assume nominal rigidities, aggregate demand shocks could affect not only nominal variables but also real variables, such as output. Moreover, money interestingly is not neutral in oil exporting countries. FEDVs suggest that monetary shocks are significantly positive motivations to economic output such that in long run they are responsible for the majority of output fluctuations; more than 60 % after 5 years and more than 67 % after 10 years. This result is consistent with variance decompositions of Boye (2001) for Ecuador which approves the significant role of money supply in explaining future movements of GDP. As IRFs show, when a shock in aggregate demand or money supply occurs, in first three years, economic output increases with an accelerating rate. But after that, these effects approximately remain constant in the long run. These results about output and monetary shocks, again, highlights the role of government as the agent who widely affects aggregate demand and money base in oil-based economies and approves that in such countries keeping the real sector of economy far from volatile oil price fluctuations is very important.

Besides, oil shocks expectedly affect GDP positively. This result is consistent with our expectations and approves most other studies' findings for oil exporting countries (e.g. Saptafora and Warner, 1995; as Dibooglu and Aleisa, 2004; Mehrara and Oskui, 2007; Farzanegan and Markwardt, 2009 and Berument et al., 2010). Oil price hike means more funds for government to initiate or fullfill

unfinished developmental projects. Although in most cases this windfall is used ineffectively, we cannot reject this hypothesis that oil shocks facilitate economic activities in oil exporting countries. Of course, suggesting that proper policies lead to better results, the direct magnitude of effects of an oil shock on GDP - as an external shock - is less than the role of domestic shocks driven by behavior of economic agents, specifically government. Our results are in line with Brown and Yücel (1999) who found that internal shocks – in comparison with oil shocks - explain larger portion of the output fluctuation. Of course, it should be noted that the degree of dependency of oil exporting countries to oil revenue varies in different countries. In other words, various countries response differently to oil shocks (see Lescaoux and Mignon, 2008; Berument et al., 2010). So, leaving any general conclusion about individual countries, one may conclude that oil exporting countries, on average, are deriving a benefit from oil price hikes. According to our FEVDs, oil price in long run explains 11 % of future output movements. Although this modest effect does not rank oil revenue as the dominant determinant of output fluctuations in oil exporting countries, in comparison with developed countries, the magnitude of this effect is still large (for example, see Hooker, 2004 for G7).

4.2.3 Response of money supply

Adjustment dynamics of money supply in response to different shocks are portrayed in Figure 3. As expected money shocks have the greatest impact on money base in all time horizons. When such a shock occurs, money supply increases in the first period and after reaching its maximum in the following year, smoothly decreases. Similarly, according to FEVDs, in long run, money shocks are responsible for nearly 78 percent of money supply fluctuations. This result highlights the role of monetary policy making process in Nigeria because these shocks not only have permanent effects on money movements, but actuate both output and price fluctuations. In sum, one can conclude that monetary factors are the main cause of macroeconomic variations in Nigeria. Moreover, in response to the output shocks, money supply continuously increases in both short and long run. This result in addition to previous findings about the impacts of money shocks on output suggests a bi-directional causal relationship between money and economic output in oil exporting countries. To compare the magnitude of this mutual causal relation, one can compare variance decomposition results. The FEVDs indicate that the causal relationship from money to output expectedly is more powerful than the opposite direction.

This strong correlation between money supply and aggregate demand, possibly relates to the role of large government and its fiscal policy implications. Oil shocks also increase money base. Considering FEVDs, in the short run oil shocks by explaining approximately 5.5 % of money fluctuations do not have a huge impact on money supply but their share steadily increase and in long run reaches to more than 18 percents. This result is another sign of dependency of Nigerian oil revenue. In Nigeria, big government receives oil revenue and when oil price hikes, spends this additional fund through financing industrial projects or welfare-oriented public spending. Of course, the modest impacts of oil shocks on monetary policy possibly relates to recent programs aimed in isolating the oil-based economies of oil exporting countries from oil variations. If we focus on the long run, according to FEVDs, oil shocks explain nearly 11 % of output fluctuations, less than 1 % of price variations and more than 18 % of money supply movements. So, oil shocks' impacts on money are greater than other macroeconomic variables. Considering significant effects of monetary shocks on price level and output, one may conclude that oil shocks through monetary channels transmit to oil exporting economies. This indirect relation highlights the importance of monetary policy – and consequently, the independency of central banks from government- in limiting oil shocks' impacts on macro-economy.

Figure 3. Response of Money supply

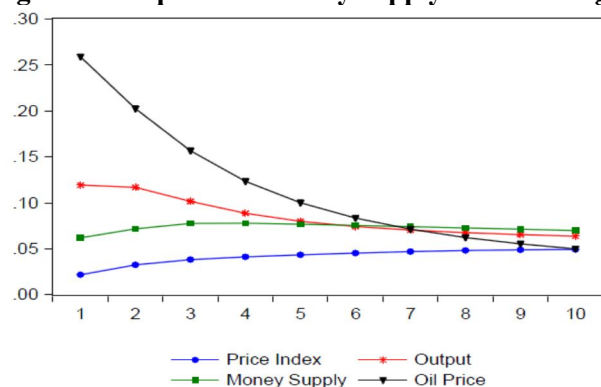
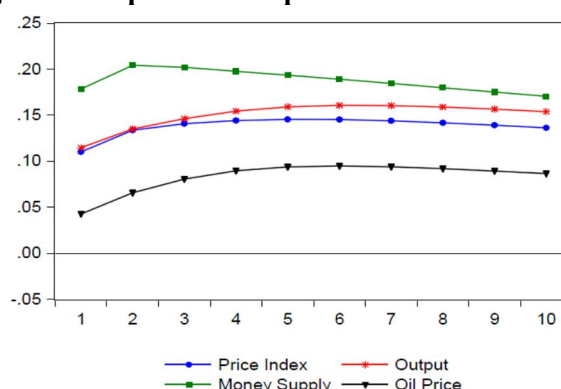


Figure 4. Response of Oil price



4.2.4 Response of oil price

Figure 4 represents the accumulated response of oil price to shocks in all macroeconomic variables. The IRF graphs show that oil shocks more than any other variable affect oil price. Following oil shocks, output and, to a lesser degree, monetary shocks have small but significant impacts on oil price. This is in line with previous studies. Mehrara and Oskoui (2007) as well as Dibooglu and Aleisa (2004) found that domestic macroeconomic variable in Saudi Arabia and to a lesser degree, in Kuwait have sizable impacts on world oil price. Moreover, Olomola and Adejumo (2006) have suggested that macroeconomic variables may cause oil price movements.

The variance decompositions for real oil price suggest that approximately 90% of the forecast error variance of oil prices is explained by its own shocks. This result confirms our prior expectations that Nigeria is not big enough to largely affect world oil market. Of course, in long run the share of domestic shocks, in particular output and money increase while price shocks are of no importance in explaining oil price fluctuations. This considerable power of net oil exporters provides a reasonable explanation for the growing importance of international agreements between oil exporting countries like OPEC production shares.

5. Conclusion

This paper investigated the sources of macroeconomic fluctuations in oil dependent economy-Nigeria. So, in addition to domestic price level, real output and money supply, oil price shocks were studied. Despite the large body of literature on the effects of oil shocks on developed oil importers, this study focused on a country specific oil exporter-Nigeria. The IRFs and FEVDs results suggest that domestic policies –instead of oil booms- should be blamed for inflation. Among other studies, money shocks, specifically in long run, are the most important one if we focus on price level. Besides, although oil shocks have significant positive impacts on economic output, money shocks are the main cause of GDP fluctuations.

To explain money movements, money shocks and external oil shocks have greater shares. Finally, oil price variations are driven mostly by oil shocks. However, domestic shocks are responsible for a reasonable portion of oil price variations. Considering these results, money supply driven by its own shocks and oil price changes, are the main cause of macroeconomic fluctuations in Nigeria. This finding that money is not neutral in Nigeria is of great policy implications. Besides, oil shocks have moderate direct impact on money supply and GDP, and no significant impact on price level.

Considering recent studies like Devlin and Lewin (2004) and Iwayemi and Fowowe (2011), one can say that most oil producers are isolating real sectors of their economies from volatile oil price. But, since oil shocks are the second important cause of money supply as the most important cause of macroeconomic fluctuations, one can conclude that oil still has very important indirect impact on the Nigerian economy and the monetary policy is the channel through which this indirect impact transmits.

References

- Al-Mutairi, N. (1993), Determinants of the sources of output fluctuations in Kuwait. *Finance and Industry*, 11, 20-78.
- Alotaibi, B. (2006), Oil Price Fluctuations and the Gulf Cooperation Council (GCC) Countries, 1960 - 2004, Ph.D dissertation, Southern Illinois University Carbondale.
- Anashasy, E-A., Bradly, D B., Joutz, F. (2005), Evidence on the Role of Oil Prices in Venezuela's Economic Performance: 1950-2001. Working Paper, George Washington University.
- Bernanke, B.S. (2004), Oil and the Economy. Remarks at the Distinguished Series, Darton College, Albany, Georgia.
- Bernanke, B.S., Gertler, M., Watson, M. (1997), Systematic monetary policy and the effects of oil price shocks. *Brookings Papers on Economic Activity*, 1, 91-142.
- Berument, H., Ceylan, N.B., Dogan, N. (2010), The Impact of Oil Price Shocks on the Economic Growth of the Selected MENA Countries. *The Energy Journal*, 31(1), 149-176.
- Blanchard, O.J., Perotti, R. (2002), An Empirical Characterization of the Dynamic Effects of Fiscal Policy. *Mimeo, Department of Economics, Columbia*.
- Boye, F. (2001), Oil and macroeconomic fluctuations in Ecuador. *OPEC Review*, 25, 145-172.
- Boye, F. (2002), Oil and Macroeconomic Fluctuations in Mexico. *OPEC Review*, 26, 309-333.
- British Petroleum Review of World Energy (BPRWE), 2011.
- Brown, S.P.A., Yücel, M.K. (1999), Oil prices and U.S. aggregate economic activity. Federal Reserve Bank of Dallas Economic Review, 16-53.
- CBN (2011), *Statistical Bulletin*, Vol. 21, Central Bank of Nigeria, Abuja, December.
- Dehn, J. (2001), The effects on growth of commodity price uncertainty and shocks. World Bank, Development Research Group, Policy Research Working Paper, 24, 55-73.
- Devlin, J., Lewin, M. (2004), Managing Oil Booms and Busts in Developing Countries, Draft Chapter for Managing Volatility and Crises. A Practitioner's Guide.
- Dibooğlu, S., Aleisa, E. (2004), Oil Prices, Terms of Trade Shocks, and Macroeconomic Fluctuations in Saudi Arabia. *Contemporary Economic Policy*, 22(1), 50-62.
- Dotsey, M., Reid, M. (1992), Oil Shocks, Monetary Policy, and Economic Activity. *Federal Reserve Bank of Richmond Economic Review*, 14-27.
- Eltony, M.N. (2001), Oil Price fluctuations and their Impact on the Macroeconomic Variables of Kuwait: A Case Study Using VAR Model for Kuwait. Arab Planning Institute (API), Working Paper number 9908.
- Farzanegan, M., Markwardt, G. (2009), The Effect of Oil Price Shocks on Iranian Economy. *Energy Economics*, 31, 134-151.
- Gisser, M., Goodwin, T. (1986), Crude Oil and Macroeconomy: Tests of Some Popular Notions. *Journal of Money, Credit and Banking*, 18(1), 95-103.
- Hamilton, J.D. (1983), Oil and the macroeconomy since World War II. *Journal of Political Economy*, 91, 228-248.
- Hamilton, J.D. (1996), This is what happened to the oil price-macroeconomy relationship". *Journal of Monetary Economics*, 38, 215-220.
- Hooker, M.A. (2002), Are oil shocks inflationary? Asymmetric and nonlinear specifications versus changes in regime, *Journal of Money, Credit and Banking*, 34(2), 540-561.
- Iwayemi, A., Fowowe, B. (2011), Impact of oil price shocks on selected macroeconomic variables in Nigeria". *Energy Policy*, 39 (2), 603-612.
- Jimenez-Rodriguez, R., Sanchez, M. (2005), Oil price shocks and real GDP growth: empirical evidence for some OECD countries. *Applied Economics*, 37, 201-228.
- Kilian, L. (2005), The effects of exogenous oil supply shocks on output and inflation: evidence from the G7 countries. Centre for Economic Policy Research, Discussion Paper No. 5404
- Kireyev, A. (2000), Comparative Macroeconomic Dynamics in the Arab World: A Panel VAR Approach. IMF working paper, Middle Eastern Department, WP/00/54.
- Lescaroux, F., Mignon, V. (2008), On the influence of oil prices on economic activity and other macroeconomic and financial variables. *OPEC Energy Review*, 32(4), 343-380.
- Mehrara, M., Oskoui, N.K. (2007), The sources of macroeconomic fluctuations in oil exporting countries: A comparative study. *Economic Modeling*, 24, 365-379.

- Olomola, P.A., Adejumo, A.V. (2006), Oil Price Shock and Macroeconomic Activities in Nigeria. *International Research Journal of Finance and Economics*, 3, 28-34.
- Rosser, J. B., Sheehan, G. R. (1995), A Vector Autoregressive Model for Saudi Arabian Economy. *Journal of Economics and Business*, 47(1), 79-90.
- Saptafora, N., Warner, A. (1995), Macroeconomic effects of terms-of-trade shocks: the case of oil-exporting countries. Policy Research Working Paper, World Bank.
- Sims, C.A. (1980), Macroeconomic and Reality. *Econometrica*, 48 (1), 1-48
- Tatom, J.A. (1988), Are the Macroeconomic Effects of Oil Price Changes Symmetric? Carnegie-Rochester Conference Series on Public Policy, 28, 325-68.
- Ward, D.B., Siregar, H. (2001), The Role of Aggregate Demand Shocks in Explaining Indonesian Macroeconomic Fluctuations. Commerce Division, Lincoln University, Discussion Paper No. 86